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SCHEDULE 14A

Proxy Statement Pursuant to Section 14(a) of
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Axcelis Technologies, Inc.

(Name of Registrant as Specified In Its Charter)

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News Release

**AXCELIS SENDS LETTER TO STOCKHOLDERS OUTLINING
ACTIONS TAKEN TO CREATE STOCKHOLDER VALUE**

BEVERLY, Mass. — February 13, 2015 — Axcelis Technologies, Inc. (Nasdaq: ACLS) today released the following letter to the Company's stockholders outlining the significant actions the Company's Board of Directors and management team have taken to create stockholder value and best position the Company for the future.

The full text of the stockholder letter is as follows:

February 13, 2015

Dear Fellow Stockholders of Axcelis Technologies:

As we prepare for the 2015 Annual Meeting in May, we want to inform you of the nine Board nominees that the Company will be nominating for election this year and update you on the significant actions the Axcelis Board and management team have taken to best position the Company for the future.

AXCELIS HAS TAKEN BOLD ACTION TO CREATE STOCKHOLDER VALUE

Your Board and management at Axcelis are executing on a well-defined strategic plan designed to create sustainable, long-term stockholder value. Since 2011, the Company has:

- **Developed and introduced the full Purion product offering**, which is enabling us to gain share and establish a leadership position in the ion implantation market;
- **Significantly reduced operating expenses** in demonstrating our focus on cost discipline;
- **Improved capital allocation and strengthened our balance sheet** to drive stockholder returns;
- **Enhanced our management team** by adding four new executives to the top six positions at the company;
- **Transformed our Board with fresh perspectives and experienced leadership** so that our 2015 slate will include a total of five nominees — a majority of the Board — who are new or who have served only one year; and
- **Engaged in productive, ongoing discussions with stockholders and incorporated their input into the Company's latest actions**, including our recent sale leaseback transaction, the nomination of our new Board candidates and several governance policy improvements.

Now is an exciting time for the Company, as we are just starting to reap the benefits of these efforts, as evidenced by Axcelis' strong operating and financial performance in the fourth quarter of 2014, strong solid outlook for 2015 and significant recent stock price appreciation — up 67% since our 2014 Annual Meeting.

DEVELOPMENT OF THE PURION PRODUCT FAMILY IS WELL TIMED AND THE PLATFORM IS GAINING MOMENTUM WITH CUSTOMERS

Beginning with decisions made in 2011, the Axcelis management team and Board maintained sufficient critical investment in the Purion technology throughout a period of lower revenues. As a result, the industry-leading Purion platform is now beginning to drive substantial stockholder value.

Axcelis' development of a full Purion product family over the last several years comes at an excellent time, as the ion implantation market is poised for disruption. The Purion H, M, and XE give Axcelis access to 100% of the ion implantation market, something the Company had not achieved with its first-generation Optima single wafer products. More importantly, the Purion common platform, innovative scanned spot beam technology, advanced energy filter and Eterna ELS source have enabled the Purion products to gain momentum rapidly with potential customers:

- Two customers in the memory market are experiencing the full power of the Purion platform — with all three types of Purion products running in production.
- The newest member of the family, the Purion H high current system, was first shipped in July 2014, and to date, the Company has installed six Purion H in multiple fabs for memory applications, and expects additional shipments in Q1 and Q2. The introduction of Purion H is critical to Axcelis' market share gains, since the high current market represents 60% of the ion implant market.
- There are multiple Purion M medium current systems running in production at memory and foundry fabs, and customer interest is high.
- The industry-leading Purion XE high energy implanter continues to have success in memory and non-memory markets including sensors, power devices and specialty logic chips.

Looking ahead, we believe 2015 will be a year of significant demand for Purion — with the memory requirements for both DRAM and NAND in mobile devices and data center applications increasing rapidly.

THIRD PARTIES AGREE THAT WE ARE POISED FOR GROWTH WITH A PROMISING STRATEGY(i)

“We have noted that the crux of the long-term story lies in the company's ability to gain traction for its new Purion product platform (medium and high current). On this front, the company is also executing well, where it is already seeing high volume production acceptance faster than expected for its Purion H (high current) product. One leading-edge memory customer has implemented Purion H into its new DRAM fab, while a second DRAM customer is currently in evaluations... Additionally, the company is targeting to seed an evaluation unit with a leading-edge foundry for next generation FinFET production. We believe these moves not only favorably set up growth in 2015 but beyond as well.” — *Patrick Ho, Stifel, Nicolaus & Company, February 6, 2015*

“ACLS appears well positioned for an exceptionally strong 2015, and we expect the stock to move higher as the company garners more wins.” — *Y. Edwin Mok, Needham & Company, February 6, 2015*

“The faster than expected ramp of Purion H systems is starting to show the potential for ACLS to reach longer term goals of \$115MM+/\$0.20+ in peak quarterly revenue/EPS (Co targets by C17). Our increased target multiple represents increased confidence in meeting the longer term targets.” — *Brett Piira, B. Riley & Co., February 6, 2015*

AXCELIS HAS TAKEN DECISIVE STEPS TO INCREASE PROFITABILITY AND DRIVE STOCKHOLDER VALUE

Reducing Operating Expenses — Axcelis has maintained strong cost control discipline throughout Purion's development. Over the past several years, the Company has reduced SG&A and R&D significantly. From 2011 to 2014, our employee and temporary worker headcount dropped from 1,046 to 765, representing a 27% reduction. In 2012, 2013, and most recently, during the 2014 mid-year industry pause, Axcelis implemented three weeks of unpaid furloughs, further controlling costs. In addition, our management team continually evaluates additional cost reduction initiatives with an intense focus on optimizing the cost structure of the business without negatively impacting investments in Axcelis' future.

Enhancing Gross Margin — As we conclude the ramp-up of Purion H production from a cold start, which naturally had an impact on gross margin, the Company has a detailed gross margin improvement roadmap in place to exit 2015 in the high end of the mid-30% range, and to achieve over 40% gross margins by 2017.

Combined, these actions have created significant operating leverage, which will translate to increased profitability and cash generation as top-line growth continues to be realized.

Improving Capital Allocation and Balance Sheet Utilization — Development of an ion implantation system is inherently capital-intensive, and our capital allocation discipline continues to be a critical element to Axcelis' success. Over the past several years, the Company has divested all of its non-core assets, including the dry strip business, to focus exclusively on ion implantation products. The majority of the required investment for the Purion platform has been made and is starting to pay dividends.

In addition, as we announced in early February, the Company completed a sale leaseback transaction for Axcelis' headquarters building with an affiliate of Middleton Partners. Under this transaction, the Company received a purchase price of \$49 million in cash, and signed a 22-year lease on the property with very favorable terms. The sale leaseback further enhanced our strong balance sheet and flexibility as we grow the business.

AXCELIS' NEWLY ESTABLISHED MANAGEMENT TEAM AND BOARD ARE COMMITTED TO ACTING IN THE BEST INTERESTS OF ALL AXCELIS STOCKHOLDERS

Over the past several years, Axcelis has taken significant actions to build a seasoned and experienced management team and to institute best practices in corporate governance. The Company has named new executives to four of the six top management positions, including:

- **Kevin Brewer** as Executive Vice President and Chief Financial Officer in June 2013.
- **John Aldeborgh** as Executive Vice President, Customer Operations in January 2013.
- **Bill Bintz** as Executive Vice President of Engineering and Marketing in April 2011.
- **Doug Lawson** as Executive Vice President of Corporate Marketing and Strategy in November 2013.

In planning for anticipated Board succession, Axcelis commenced a program in 2011 to refresh our Board of Directors. Specifically:

- In 2011, Joseph Keithley was added to the Board. Mr. Keithley spent almost 20 years as the Chairman, CEO and President of Keithley Instruments, and has brought to Axcelis significant operating experience and industry knowledge.
- In 2014, stockholders elected two new Board members: Arthur George and Barbara Lundberg. Mr. George spent 30 years at Texas Instruments, and has brought deep semiconductor industry knowledge to the Board. Ms. Lundberg was the CEO and Vice Chairman of the Supervisory Board of Tele-Fonika, and has provided significant strategic, operational and financial execution expertise.

As expected, in August 2014, as part of our Board renewal program, three current Axcelis Board members, Stephen Hardis, Brian Thompson and William Jennings indicated their desire not to be nominated for re-election in May 2015. In connection with these decisions, our Board adopted a policy not to nominate director candidates who would be 75 years old or older upon election. Our three retiring directors all made significant contributions to our efforts over the years, and played strong roles in the implementation of the Purion strategy and the enhancement of the Axcelis management team, discussed above. We thank them deeply for their contributions.

At the 2015 Annual Meeting, the Company will be nominating three highly qualified new directors, each of whom will bring fresh and valuable perspectives to our diverse Board. Notably, as part of our ongoing commitment to our stockholders and listening to their viewpoints, these new candidates were selected in conjunction with stockholder feedback. The nominees include:

- **Jim Green**, who will bring strong operating experience and a commitment to turnaround management to the Axcelis Board. He has been the Chief Executive Officer and President of Analogic Corporation since 2007. From 2005 to 2007, Mr. Green was Regional Vice President, California Division, of Quest Diagnostics Incorporated, a leading provider of diagnostic testing information and services. Before joining Quest, Mr. Green served as Senior Vice President & General Manager of Computed Tomography for Philips Medical Systems, a global leader in the business of developing, manufacturing, marketing, and servicing medical computed tomography systems.
- **Duy-Loan Le**, who is a recognized semiconductor technologist with broad board experience and extensive experience in various aspects of semiconductor design and manufacturing. During her 31-year career at Texas Instruments, Inc., Ms. Le became the first woman at TI elected to the rank of Senior Fellow. Prior to this role, she held leadership positions throughout TI. Ms. Le is currently the Embedded Processing (EP) RAMP Manager, responsible for technology readiness and product execution for TI's multibillion-dollar digital business. Ms. Le has been awarded 24 patents and has seven pending patent applications. Ms. Le is also a board member at National Instruments, a supplier of measurement and control hardware and software to the engineering and scientific communities to accelerate productivity, innovation and discovery, and eSilicon, a leading independent semiconductor design and manufacturing solutions provider.
- **Thomas St. Dennis**, who will bring a career's worth of significant semiconductor experience, having served as the Chief Executive Officer at FormFactor Inc. from 2010 to 2014, and as the Company's Executive Chairman of the Board of Directors since 2013. Prior to FormFactor, Mr. St. Dennis held various positions at Applied Materials, Inc. from 1992 to 1999 and again from 2005 to 2009. He also served as Executive Vice President of Sales and Marketing at Novellus Systems, Inc. from 2003 to 2005. From 1999 to 2003, Mr. St. Dennis was President and CEO of Wind River Systems, Inc. Mr. St. Dennis is currently a director of Mattson Technology, Inc., a provider of semiconductor wafer processing equipment used in the fabrication of integrated circuits.

The Board is also nominating six current members, three of whom joined the Board in the past four years:

- **R. John Fletcher** is Chief Executive Officer of Fletcher Spaght, Inc., a strategy consulting organization, which he founded in 1983, and Managing Director of Fletcher Spaght Ventures, a venture capital fund. Prior to founding Fletcher Spaght, Inc., Mr. Fletcher was a Manager at the Boston Consulting Group. Mr. Fletcher is also a director of The Spectranetics Corporation. During

the past five years, he was also a director of AutoImmune, Inc., Panacos, Inc. and Marina Biotech, Inc.

- **Arthur L. George, Jr.** has had a 30 year career at Texas Instruments, one of the world's largest semiconductor companies and a highly innovative, high performing global leader in analog, embedded processing and wireless technologies. Until recently, Mr. George served as Senior Vice President and Manager of TI's Analog Engineering Operations, a position he held since 2010. Prior to this Mr. George served as Senior Vice President and General Manager of TI's High Performance Analog business unit. In addition to Axcelis, Mr. George also serves on the Board of Directors of Nordson Corporation, a manufacturer of precision dispensing equipment.
- **Joseph Keithley** has over three decades of experience in high technology markets. Most recently, Mr. Keithley was Chairman of the board, Chief Executive Officer and President of Keithley Instruments, a supplier of test and measurement systems for the electronics, wireless and semiconductor industries, until the company's sale last year. Since he joined Keithley Instruments in 1976, he held several executive and management positions with the company. In addition to Axcelis Technologies, Mr. Keithley holds the position of Chairman of the board at Nordson Corporation and is on the board of directors of Materion Corporation.
- **Barbara J. Lundberg** has over thirty years of significant executive experience across multiple industries, including deep experience with the issues confronting growing technology and technology-based equipment companies. From 2012 to 2013, Ms. Lundberg served as CEO and Vice Chairman of the Supervisory Board of Tele-Fonika Kable, one of the largest cable manufacturers in Europe. Prior to that, Ms. Lundberg was a consultant with Kolaja & Partners, now part of Alvarez & Marsal. Between 1999 and 2001, Ms. Lundberg was CEO of Elektrim S.A., a multi-industry conglomerate and one of the largest companies in Poland. Earlier in her career, Ms. Lundberg worked primarily with U.S. technology and emerging growth businesses, including opening the Silicon Valley office of Apax Partners.
- **Patrick H. Nettles** has served as Executive Chairman of the Board of Directors of CIENA Corporation, a manufacturer of optical networking equipment, since May 2001. Prior to that, Mr. Nettles served as Chairman of the Board of Directors and Chief Executive Officer of CIENA from October 2000, as its President, Chief Executive Officer and Director from April 1994, and as its Director and Chief Executive Officer from February 1994. Mr. Nettles is a director of Progressive Corporation.
- **Mary G. Puma** is Axcelis' Chief Executive Officer (since January 2002) and President (since May 2000). Ms. Puma has also served as Chairman since May 2005, a position that will be assigned to an independent director immediately following the 2015 Annual Meeting. Prior to becoming Chief Executive Officer, Ms. Puma served as Chief Operating Officer from May 2000. In 1998, she became General Manager and Vice President of the Company's predecessor, the Implant Systems Division of Eaton Corporation, a global diversified industrial manufacturer. In May 1996, she joined Eaton as General Manager of the Commercial Controls Division. Prior to joining Eaton, Ms. Puma spent 15 years in various marketing and general management positions for General Electric Company. Ms. Puma is also a director of Nordson Corporation and of Semiconductor Equipment and Materials International (SEMI), a trade association.

With the nominations of Mr. Green, Mr. St. Dennis, and Ms. Le, **five of our nine nominated directors will have served one year or less on the Axcelis Board, and all are independent, other than Ms. Puma.**

Lastly, as noted in Ms. Puma's above biography, to further enhance our corporate governance, the Board will select one of the independent directors to serve as a new independent Chairman of the Board at the May 2015 Board Meeting.

WITH THE RIGHT PLAN AND LEADERSHIP IN PLACE, AXCELIS IS WELL POSITIONED FOR CONTINUED SUCCESS

The Board is committed to maintaining an open dialogue with our stockholders, and we consider stockholder input as part of our ongoing focus on creating long-term value and ensuring good corporate governance. We are listening — in fact, we have implemented many suggestions from our investors, such as encouraging us to pursue a sale leaseback and providing us with names of potential Board candidates.

We believe we have made great progress over the past several years toward enhancing our business and capital structure, while regaining market share in the ion implantation market. As a result, Axcelis is well-positioned with our Purion strategy and enhanced leadership team to gain further market share, improve financial results and drive long-term value for all stockholders.

Instructions for how to vote for Axcelis' Board nominees will be sent to you separately when we file and mail you our proxy materials.

Thank you for your continued support of Axcelis.

The Board of Directors of Axcelis Technologies, Inc.

Safe Harbor Statement

This letter contains forward-looking statements under the SEC safe harbor provisions. These statements, which include our guidance for future financial performance, are based on management's current expectations and should be viewed with caution. They are subject to various risks and uncertainties, many of which are outside the control of the Company, including the timing of orders and shipments, the conversion of orders to revenue in any particular quarter, or at all, the continuing demand for semiconductor equipment, relative market growth, continuity of business relationships with and purchases by major customers, competitive pressure on sales and pricing, increases in material and other production costs that cannot be recouped in product pricing and global economic, political and financial conditions. These risks and other risk factors relating to Axcelis are described more fully in the most recent Form 10-K filed by Axcelis and in other documents filed from time to time with the Securities and Exchange Commission.

Important Additional Information

Axcelis intends to file a proxy statement and WHITE proxy card with the Securities and Exchange Commission (the "SEC") in connection with the solicitation of proxies for the 2015 Annual Meeting (the "Proxy Statement"). Axcelis, its directors, nominees and certain of its executive officers will be participants in the solicitation of proxies from stockholders in respect of the 2015 Annual Meeting. Information regarding the names of Axcelis' directors and executive officers and their respective interests in Axcelis by security holdings or otherwise is set forth in Axcelis' proxy statement for the 2014 Annual Meeting of Stockholders, filed with the SEC on March 25, 2014. Axcelis' director nominees for the 2015 Annual Meeting has been identified in this press release, which will be filed on a Current Report on Form

8-K. To the extent holdings of such participants in Axcelis' securities have changed, such changes have been reflected on Initial Statements of Beneficial Ownership on Form 3 or Statements of Change in Ownership on Form 4 filed with the SEC. Additional information can also be found in Axcelis' Annual Report on Form 10-K for the fiscal year ended December 31, 2013, filed with the SEC on March 3, 2014 and in Axcelis' Quarterly Reports on Form 10-Q for the first three quarters of the fiscal year ended December 31, 2014 filed with the SEC on May 8, 2014, August 8, 2014 and November 6, 2014, respectively. Details concerning the nominees of Axcelis' Board of Directors for election at the 2015 Annual Meeting will be included in the Proxy Statement. BEFORE MAKING ANY VOTING DECISION, INVESTORS AND STOCKHOLDERS OF THE COMPANY ARE URGED TO READ ALL RELEVANT DOCUMENTS FILED WITH OR FURNISHED TO THE SEC, INCLUDING THE COMPANY'S DEFINITIVE PROXY STATEMENT AND ANY SUPPLEMENTS THERETO BECAUSE THEY WILL CONTAIN IMPORTANT INFORMATION. Investors and stockholders will be able to obtain a copy of the definitive proxy statement and other documents filed by the Company free of charge from the SEC's website, www.sec.gov. The Company's stockholders will also be able to obtain, without charge, a copy of the definitive Proxy Statement and other relevant filed documents by directing a request by mail to Axcelis Technologies, Inc., 108 Cherry Hill Drive, Beverly, Massachusetts 01915, Attn: Corporate Secretary, telephone: (978) 787-4000, or from the Company's website, <http://investor.axcelis.com>.

About Axcelis

Axcelis (ACLS), headquartered in Beverly, Mass., has been providing innovative, high-productivity solutions for the semiconductor industry for over 35 years. Axcelis is dedicated to developing enabling process applications through the design, manufacture and complete life cycle support of ion implantation systems, one of the most critical and enabling steps in the IC manufacturing process. Learn more about Axcelis at www.axcelis.com.

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(i) Permission to use quotations neither sought nor obtained.

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